DEFIBRILLATOR ANALYZER
Model QED-III

OPERATOR'S MANUAL

BIO-TEK
INSTRUMENTS, INC.

BIO-TEK

DEFIBRILLATOR ANALYZER

MODEL QED-III

OPERATOR'S MANUAL

MANUAL PART NUMBER 94011

REVISION F

FOR SERIAL NUMBERS 1382 AND UP

WITH AND WITHOUT SYNC TEST OPTION

BIO-TEK INSTRUMENTS, INC.

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A through E			Revisions prior to addition of Document Revision Record.
F	11/20/86	Title Page	Updated Title Page.
		Document Revision Record	Added Document Revision Record Page.
		Section 2.0	Item d, changed: "DEFIB IN" to: "R" wave output.
			Item e, changed: "SCOPE SYNC" to: "R wave."
		Section 3.3	Last paragraph, first sentence, changed: "paddles" to: "left paddle."
		Section 5.0	Item 4, first sentence added "on the defibrillator."
		Section 6.2	First paragraph, first sentence, changed: "pulse" to: "ECG 'R' wave;" second sentence, added: "of the 'R' wave."
			Item 5, deleted; new Item 5 & 6 added, former items 6 & 7, now Items 7 & 8.
			Item 7, deleted: "or the defibrillator will have ...LED."; added: "(Refer to Section 6.2 ...results.)"
	11/20/86	Section 7.1	Deleted last paragraph; added information for: "SHIPPING."
		Section 7.3	Item A6, first sentence, changed: "0-10 volts" to: "0-100 volts."
			Item B5, replaced.
		Section 7.4	Added.
		Schematic, Component Layout, and Parts Lists	Updated.

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1.0 INTRODUCTION

1.1 GENERAL

Bio-Tek Instruments has designed the Model QED-III, a quantitative energy measuring system, to test A.C. or D.C. defibrillators for the energy output delivered under all operating conditions.

This portable instrument is simple to operate and provides accurate test data. It can be used anywhere to evaluate whether a defibrillator will perform according to requirements when needed.

Testing can be performed on defibrillators that have grounded or ungrounded paddles and the results can be easily displayed on an external oscilloscope.

1.2 APPLICATIONS

The Model QED-III is designed for use by engineering personnel to test defibrillators for proper operation, and to calibrate their energy output.

The QED-III can be used by professional personel in the operating room, intensive care, and coronary care, as well as on rescue vehicles, to do daily quality tests. The defibrillator is an emergency piece of equipment that must function properly on the first try. The QED-III insures the proper operation of a defibrillator when it is needed.

2.0 DESCRIPTION

The Model QED-III is housed in a heavy duty case covered with a durable plastic laminate. A removable cover is included.

The QED-III's meter face is divided into three scales. These scales are:

Scale Range	Resolution
0-50 watt-seconds	1 watt-seconds
0-500 watt-seconds	10 watt-seconds
0-1000 watt-seconds	20 watt-seconds

A red battery check line is located at mid-scale. A gray range selection switch, battery check button and two female banana jacks for the isolated output are located below the meter.

To the right and left of the meter are stainless steel contact plates; under the left plate is the QED-III's activation switch.

If the QED-III has been purchased with a sync test option, the front panel will have the following additional features:

a. Sync Test ON/OFF toggle switch

b. Three indicator lights (red light emitting diodes) labeled PASS, FAIL, and NO SYNC.

c. 1mV/2mV "R" wave output level toggle switch.

d. "R" wave output BNC style connector - an output from QED-III consisting of a 1mV (or 2mV) simulated "R" wave.

e. Volt 'R' wave banana jacks - an output from QED-III consisting of a 1 volt version of the "R" wave output signal.

3.0 OPERATING INSTRUCTIONS

3.1 UNPACKING

Inspect the QED-III for cracks or scratches; check the meter needle to insure that it is in tact. Make certain the handle is firmly attached to the case.

If any damage is found, call Bio-Tek Instruments toll free at 800-451-5172.

3.2 SAFETY PRECAUTIONS

Caution must be used when handling defibrillator paddles. The careless operator may receive a severe shock by inadvertently touching the defibrillator paddles. Some simple rules to follow:

1. If the defibrillator is line powered, be sure that it is plugged in a grounded receptacle.

2. Apply the paddles firmly to the QED-III plates gripping one paddle in each hand.

3. Have second person assist when testing defibrillators without paddle or foot switches.

4. DO NOT touch contact plates on defibrillator.

5. DO NOT use any electrode paste or pads when testing a defibrillator with the QED-III.

6. BE CAREFUL!

3.3 BATTERY CHECK

It is recommended that the battery check be performed prior to each test series whenever there is a time lag between testing.

1. Push the red "Battery-Check" button.

2. If the meter reads above the red line, the batteries used for energy measurement are satisfactory.

3. If the meter reads below the red line, go to Section 7.2 (Battery Replacement).

4. To maintain full isolation for the optically isolated output, two separate batteries are used to power the optoisolator circuit. These batteries are not checked by the "Battery Check" function on the front of the QED-III, but normally outlive the batteries for the energy

measurement circuit. It is recommended that when the unit fails the "Battery Check", that all four batteries be replaced.

If it is necessary to check the isolation circuit batteries this can only be done by removing the unit from its case and measuring the voltage at the terminals of BA04 and BA03 with the left paddle depressed. A minimum of 7.5 VDC is required. DANGER - Do not discharge a defibrillator into the QED-III while the QED-III is outside of its case.

4.0 TESTING THE ENERGY OUTPUT OF A DEFIBRILLATOR

1. Turn the defibrillator on and follow the manufacturer's instruction for warm-up; select the output energy desired.

2. Before conducting the test, push the QED-III's red "Battey-Check" button; if the reading is above the red line on the meter face, continue with the testing; if the meter reading is below the line, discontinue testing and replace the batteries (See Maintenance, Section 7).

3. Depress the range selection switch for the desired range; if the anticipated output energy is unknown, start with the 1000 watt-second range.

4. Place one of the defibrillator paddles on the QED-III's right contact plate while firmly holding the other paddle on the left plate.

5. Initiate a discharge from the defibrillator.

6. Observe the meter reading as watt-seconds (joules) on the range scale selected; the meter will retain the reading as long as the left plate is depressed by the paddle. When observing the meter reading with the 500 watt-second range, ignore the decimal points used on the 50 watt-second range

5.0 RECOMMENDED TESTING PROCEDURE

1. An electrical safety inspection, including leakage tests should be performed monthly the details of these tests are presented in the Electrical Safety Analyzer manuals available from Bio-Tek Instruments, Highland Park, Box 998, Winooski, VT 05404-0998.

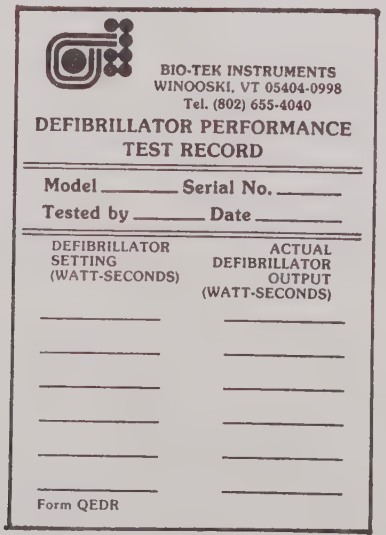
2. In addition to the previously mentioned procedures, mechanical inspection of the defibrillator should be carried out daily. The paddles and lead wires and the power cord must be examined for cracks and frays.

3. Calibrate the defibrillator by varying the output setting in discrete steps from the low point to the high point. At each step discharge the defibrillator into the QED-III and record the defibrillator meter reading and the QED-III reading on the record tag. Record the reading on the label provided and attach the label beside the meter on the defibrillator for reference.

4. The effect of repetitive discharges on a defibrillator output can be evaluated in the following manner. Set the defibrillator power setting to the maximum level or the level at which it is most likely to be used. Note the manufacturer's specifications for charage time (e.g. 10 seconds). With the aid of the second hand of a watch, discharge the defibrillator into the QED-III 5 successive times at a rate equal to the charge time (1 discharge/10 seconds). Read the output on the QED-III for each discharge and record. There should be little or no deterioration in the output energy.

5.1 CALIBRATION AND RECORD KEEPING

1. Supplied with your Model QED-III are 100 performance record labels, Bio-Tek form QEDR:



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Tel. (802) 655-4040

DEFIBRILLATOR PERFORMANCE TEST RECORD

Model _____ Serial No. _____

Tested by _____ Date _____

DEFIBRILLATOR SETTING (WATT-SECONDS)	ACTUAL DEFIBRILLATOR OUTPUT (WATT-SECONDS)

Form QEDR

2. These test records are designed to attach to the defibrillator beside the meter. The adhesive is removable so that when the t test is given, the old label can be removed and the new test record attached.

3. The calibration can be accomplished two ways.

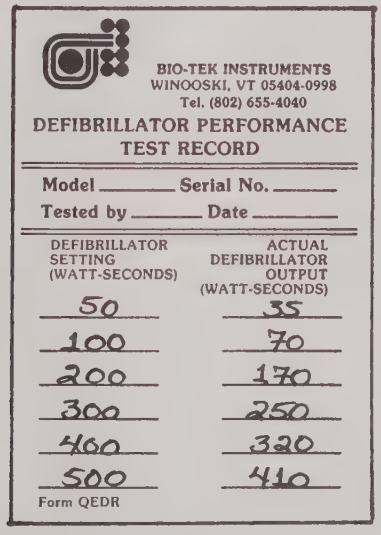
4. The fast way to calibrate the defibrillator is as follows:

   a. Set the defibrillator meter to 50, 100, 150, 200, etc. on discrete values.

   b. Record these values under defibrillator setting.

   c. Measure the output on the QED-III.

   d. Record the QED-III meter reading beside the defibrillator meter reading under actual output.



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DEFIBRILLATOR PERFORMANCE TEST RECORD

Model _____ Serial No. _____

Tested by _____ Date _____

DEFIBRILLATOR SETTING (WATT-SECONDS)	ACTUAL DEFIBRILLATOR OUTPUT (WATT-SECONDS)
50	35
100	70
200	170
300	250
400	320
500	410

Form QEDR

5. The more difficult way of calibrating the defibrillator provides the doctor and nurses using the equipment an exact meter setting for each energy desired.

   a. Set the defibrillator meter at 70 watt-seconds.

   b. Discharge the defibrillator into the QED-III.

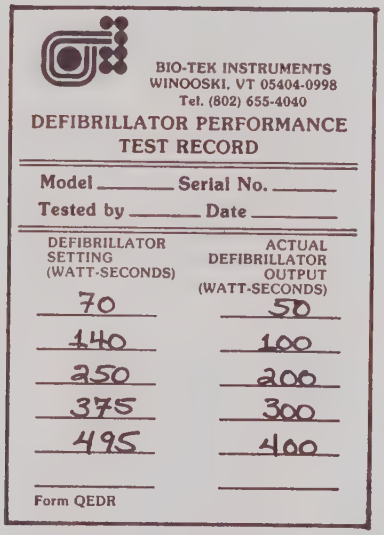
   c. If the actual output (QED-III meter reading) is not 50 watt-seconds, adjust the defibrillator meter reading either up or down to try to get the actual output 50 watt-seconds.

   d. Once the meter reading is found that gives 50 watt-seconds of output, these two values are recorded.

e. This is repeated for 100, 200, 300, and 400 and any other values that may be important.

f. The medical staff can then select an energy for each patient and dial in the energy selected.

6. Once the data is obtained, attach the label directly beside the meter for easy view.



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DEFIBRILLATOR PERFORMANCE TEST RECORD

Model _____ Serial No. _____

Tested by _____ Date _____

DEFIBRILLATOR SETTING (WATT-SECONDS)	ACTUAL DEFIBRILLATOR OUTPUT (WATT-SECONDS)
70	50
140	100
250	200
375	300
495	400

Form QEDR

6.0 USING THE ISOLATED DEFIBRILLATOR OUTPUT AND SYNC TEST

6.1 INSTRUCTIONS FOR USE WITH AN OSCILLOSCOPE

The Model QED-III provides the user with isolated output jacks for displaying discharge waveforms on an oscilloscope. The isolated output circuitry alternates the discharge pulse and eliminates the danger of shorting the defibrillator output to ground through the oscillosocpe. The following instructions describe the setup:

1. Connect the oscillosocpe to the QED-III using banana plug leads by plugging the oscilloscope ground lead into the black jack and the ungrounded vertical input lead into the red jack.

2. Set the oscilloscope trigger on external and connect a lead between the input of the oscillosocpe and the external trigger input; (or trigger internally on the waveform to be displayed).

3. Set the time scale to 1 millisecond/division, then adjust to the desired expansion after observing waveform output.

4. Set the gain to 0.2 volt/division; adjust the gain to the desired level after observing waveform.

5. Activate storage control.

6. For most applications set the oscilloscope input-coupling control to the AC-input mode. Note: the QED-III isolated oscilloscope output has a quiescent DC level of 1 to 4 VDC when the QED-III left-hand paddle is depressed. The discharge waveform is superimposed on this DC level with a 10,000: 1 attenuation factor (i.e. a +/-5000 V discharge results in a ±0.5 V change ine this signal level). Therefore, placing the oscilloscope in the AC-coupled mode will block the nominal DC output level and enable the user to select a higher gain setting for display of the discharge waveform.

If the defibrillator device under test is one which uses a discharge waveform with sizable DC components in it (i.e. trapazoidal or pulsitile discharge), better output waveform fidelity can be obtained by placing the oscilloscope in the DC-coupling mode. Here, the user can view the discharge waveform with a gain setting of 1.0 V/division or select a higher gain and use the oscilloscope vertical position control to help center the Model QED-III's DC output level.

7. Discharge the defibrillator into the Model QED-III.

8. The waveform is 1/10,000 of the input voltage through 50 ohms. The actual magnitude of the discharge voltage can be obtained by the following formula:

$V_{discharge} = 10{,}000\ (V_{scope} - V_X)$

Where $V_X = 0$ for AC input coupling, and

$V_X = V_{BIAS}$ DC input coupling (V_{BIAS}= Quiescent DC Voltage Present on the output)

If the waveform appears on the oscillosocpe, then repeat discharging after adjusting time and gain to the optimum scale of observation of the waveform.

If the waveform does not appear on the oscilloscope, reverse the paddles on the QED-III plates and repeat discharge. If the waveform still does not appear, readjust the trigger levels and repeat above.

6.2 DESCRIPTION AND USE OF THE SYNC TEST OPTION

When testing the defibrillators in the synchronous mode of operation, the QED-III sync test option presents the defibrillator's ecg circuitry with a 1 or 2mV, 60ms ECG "R" wave. In normal sychronous operation, the defibrillator's QRS detection circuitry should respond to the leading edge of this trigger pulse and discharge the defibrillator within 60ms of the "R" wave. This 60ms response time limitation is essential in clinical situtations qhere the defibrillator is operated in the synchronous mode to revert an erratic heart back to normal rhythm. Here, failure to discharge within 60ms of the ECG R-wave could result in discharge during the vulnerable upswing of the ECG T-wave resulting in fibrillation of the patient.

Thus, this option provides the following indications when testing in the synchronous mode of operation:

a. PASS - The PASS indicator lights to indicate that the defibrillator dishcarged within 60ms after the peak of the QED-III trigger pulse.

b. FAIL - The FAIL indictor lights to indicate that the defibrillator discharged after the 60ms acceptable time limit.

c. NO SYNC - The NO SYNC indicator lights if the defibrillator discharges prior to presentation of the QED-III trigger pulse. This indicates that the defibrillator's synchronous circuitry is either not engaged or failed to wait for the trigger pulse prior to discharging.

1. Connect the QED-III, Sync Adapter, and defibrillator to be tested as shown on the next page and select the appropriate lead signal (Lead I or II & III) on the Sync Adapter.

2. Turn the "SYNC TEST" control on the QED-III to the "ON" position to enable power to the sync test circuitry in the QED-III.

3. Place the defibrillator controls to those positions for synchronous operation per the manufacturer's instructions.

4. Choose either a 1 or 2 mV "ECG" output pulse level (via the level toggle switch on the QED-III).

5. Charge the defibrillator to desired level.

   Note: Operator timing is critical during Step 6 for successful Sync Test results. Read this step completely before performing.

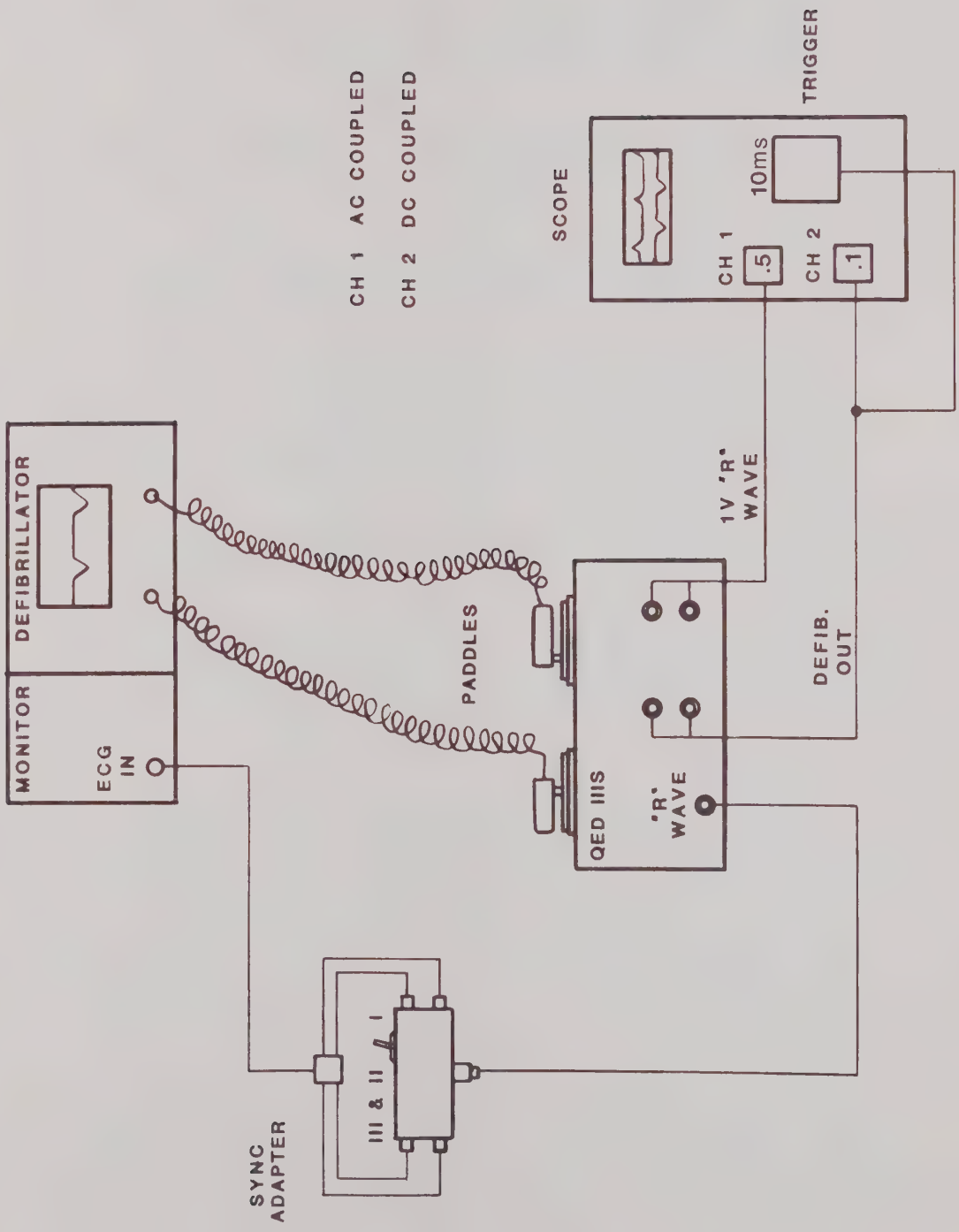
6. Place the defibrillator's paddles on the QED-III. (a false R-wave will be present as soon as the left paddle is depressed; this is necessary to reset circuits in the QED-III) Pause 1 second then enable defibrillator to discharge. A 3-5 second delay will occur before the second R-wave is present to discharge the defibrillator.

7. After presentation of the trigger pulse, the defibrillator should have discharged, lighting either the PASS, FAIL, or NO SYNC indicators.

   Note which light is lit prior to removing the defibrillator paddle from the left QED-III paddle plate as this will remove power from the sync test circuitry. (Refer to Section 6.2, items A through C, for explanation of results.)

8. A two channel storage oscilloscope can be used to measure the exact time the defibrillator discharged by connecting the QED-III's mV R-WAVE output to one channel (gain=0.5V division, coupling=DC) and to the oscilloscope's external trigger input. The output from the QED-III's isolated defibrillator output jacks is connected to the other oscilloscope channel with gain and coupling per section 6.1 above. Place the oscilloscope in the single sweep and storage modes. Note: The oscilloscope used must either be dual beam or its beam controls must be placed in the chop mode of operation.

   Following synchronous discharge, measure the distance (in divisions on the CRT screen) between the leading edge of the ECG trigger pulse on one channel and the onset of the defibrillator discharge waveform on the other channel. Multiplying this by the oscilloscope time base setting (in msec/div.) will give the numberr of milliseconds delay between application of the ECG trigger pusle and defibrillator discharge. Note that any value for this in excess of 60ms is unacceptable and could result in an extremely dangerous situaton if the defibrillator is used clinically in the synchronous mode.


CH 1 AC COUPLED
CH 2 DC COUPLED
SCOPE
TRIGGER
10ms
CH 1
.5
CH 2
.1
1V 'R' WAVE
DEFIBRILLATOR
MONITOR
ECG IN
PADDLES
QED IIIS
'R' WAVE
DEFIB. OUT
III & II
I
SYNC ADAPTER

7.0 MAINTENANCE INSTRUCTIONS

7.1 CALIBRATION AND INSTRUMENT CHECK

It is recommended that each Model QED-III be recalibrated annually. Calibration instructions are included in this manual in Section 7.3. If the user does not possess the necessary equipment for proper recalibration, return the Model QED-III to the factory, complete with a purchase order for recalibration.

SHIPPING

When the QED-III is shipped to Bio-Tek for service or repair, the unit must be shipped in the original packaging; other forms of commercially recommended packing are not recommended. If the original packing has been damaged or lost, contact Bio-Tek for replacement packing (call: 800-451-5172 or telex: 94-0136 BIO TEK SHVT).

The QED-II must be repacked according to the following procedures:

1. Place the styrofoam protective end caps on the QED-III and place within the box.

2. Seal the packing box.

3. Mark the box as **Fragile.**

Before the QED-III is returned to Bio-Tek, make sure you have addressed each item in the following checklist:

1. Obtain a **Return Authorization Number** from Bio-Tek's customer service representatives (call: 800-451-5172 or telex: 94-0136 BIO TEK SHVT).

2. Include a statement of what is required of the Bio-Tek Service Department (state whether the unit requires calibration, cleaning, or repair).

3. Include a tag that includes the Return Authorization Number, the full model number, and the serial number.

4. Provide Bio-Tek with the name and telephone number of whom Bio-Tek should contact with any questions.

5. Insure the QED-III for full value.

7.2 BATTERY REPLACEMENT

Whenever the meter indicates a reading below the red battery check line during the battery test, all of the batteries must be replaced.

Remove the four screws in the corners of the QED-III face plate. Lift the face plate out of the case. Remove the battery clips from the batteries and remove the batteries from their holders.

Replace the batteries with Mallory TR146X or equivalent. To test the new batteries, first push the battery check button and observe that the meter reads above the red battery check line. Then with the paddle switch activated, check that the terminal voltage on BA03 and BA04 is greater than 8.0 volts (for new batteries).

Place the panel back into the case and replace the four screws in the corners.

7.3 CALIBRATION

The equipment needed to calibrate the Model QED-III follows:

1. Digital multimeter capable of reading up to 100V AC and DC ±.1 volts.

2. Monopulse generator capable of producing a postive or negative pulse form 1 millisecond to 50 milliseconds in duration.

3. A high voltage amplifier capable of amplifying the pulse generator output signal to a 100V pulse at 15 milliamps.

4. An AC voltage source continuously variable up to 100V rms at 20 milliamps.

5. An oscilloscope.

A. CALIBRATION PROCEDURE: ENERGY MEASUREMENTS

1. Remove the four screws from the panel of the QED-III and remove the panel from the case.

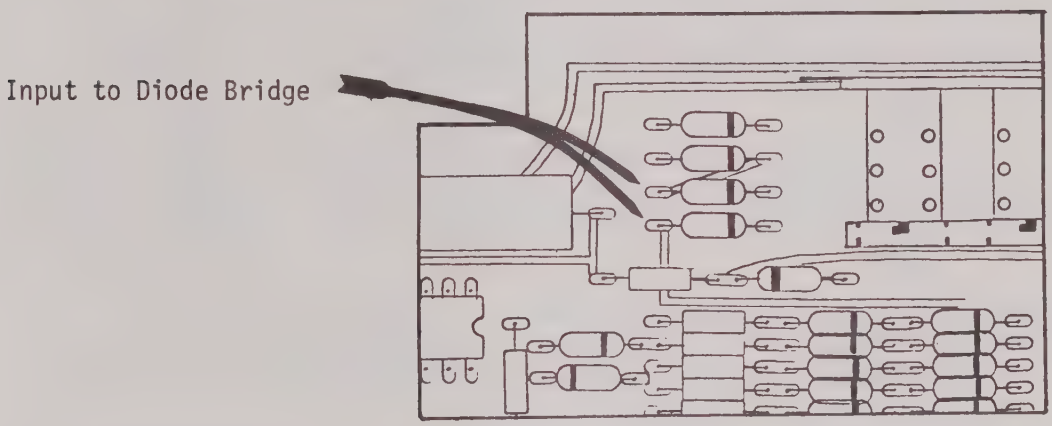
2. Without depressing the left hand plate, mechanically zero the meter by turning the screw on the meter face.

3. Depress the left hand plate and observe the needle. If the meter needles drifts noticeably, adjust R33 on the main printed circuit board until the needle stops moving. Release and again depress the plate to assure the meter no longer drifts.

4. Disconnect the connector attached to the power resistors

on the main printed circuit board.

5. Connect the output of the monopulse generator to the input of the high voltage amplifier. Connect the output of the amplifier to the diode bridge as shown in below.



6. Apply input pulses that vary in amplitude from 0-100 B6B volts and vary in time from 1 to 50 milliseconds. The energy is calculated using the following equation:

$$\text{Equivalent Energy} = \frac{(50V)^2 T}{50}$$

Where

V = Pulse voltage

T = Pulse duration

The left plate must be held down to turn the QED-III on, and released to reset B6B the unit.

7. Adjust R28 until the QED-III reads most accurately.

8. If the accuracy cannot be increased within ±2% of full scale, then the QED-III must be returned to the factory for repair.

B. CALIBRATION PROCEDURE: OPTO-ISOLATED SCOPE OUTPUT

1. CAUTION: These instructions must be followed very carefully. Failure to do so may result in damage to the QED-III.

2. Remove both connectors on the 10 pin header on the main printed circuit boards.

3. Connect the oscillosocpe between J1 and J2 (Isolated output jacks).

4. Connect the 0-100V AC voltage source between the 2nd and 4th pin of the ten pin header, counting from the end nearest the pushbutton switches. (Disregard the numbers on the top of the PC board.)

DO NOT TURN ON!

5. Apply the following voltages:

Applied Voltage (VAC)*	AC rms (Desired)	AC rms LIMIT
99.00	0.495	0.470--0.520
70.00	0.357	0.336--0.371
53.00	0.265	0.251--0.278
35.35	0.177	0.168--0.186
17.67	0.088	0.084--0.093
10.60	0.053	0.050--0.055

---

* Apply these voltages for a maximum of 2 seconds with 2 seconds between applications.

Depress the left hand plate and then apply the test voltage. Adjust R40 and R41 so that all output voltages fall within ± 5% of their nominal value and are not clipped or distorted.

C. CALIBRATON PROCEDURE; SYNC. TEST OPTION

1. Connect an oscilloscope's vertical input and external trigger input to the Model QED-III's SCOPE SYNC output jacks. Set the vertical gain to 0.5V/div., coupling to DC, sweep speed to 10 msec./div. and trigger to external. Note; the use of a storage-type oscilloscope operating in the single sweep mode will greatly facilitate this adjustment.

2. Enable the power to the sync. test option circuitry by turning the sync. the toggle switch to "ON" and depressing the left paddle on the QED-III,

3. After a delay of 2 to 7 seconds, the Model QED-III will output a trigger pulse. Adjust the 500K ohm trim pot (R114) for a pulse duration of 60 milliseconds. (This will involve releasing the left paddle and redepressing it to regenerate this trigger pulse signal.)

7.4 WARRANTY

Bio-Tek warrants the QED-III to the original purchaser for a period of 1 year from the original purchase date. The warranty is for normal use and service, against defective materials or workmanship. If the customer ships the Defibrillator Analyzer to Bio-Tek, postage pre-paid, and Bio-Tek determines the defect to be in materials or manufacturing, Bio-Tek shall either repair or replace the unit at Bio-Tek's option, without cost to the customer.

This warranty is void if the QED-III has been visibly damaged by accident, misuse, or has been repaired or altered by persons or stations not authorized by Bio-Tek, or has had the serial number altered, defaced, or removed.

Bio-Tek Instruments reserves the right to discontinue the QED-III at any time and to change the specifications, price, or design without incurring any obligation.

Bio-Tek will continue to stock service parts for up to 5 years after the manufacture of the unit has been discontinued. Parts shall include all materials, charts, instructions, diagrams, and accessories that are furnished with the unit.

The purchaser agrees to assume all liability for any damages or bodily injury that may result from the use or misuse of the unit by the purchaser, his employees, or customers.

8.0 PRINCIPLES OF OPERATION

8.1 GENERAL

The Model QED-III quantifies the energy delivered by a difibrillator by simulating the human body's resistance to current flow and measuring the flow of energy through that resistance. The resistance of the human thorax under high voltage pulse conditions has been measured and found to be between 40 and 120 ohms. From this data the standard resistance chosen in the measurement of the output energy of defibrillators is 50 ohms.

Energy is the product of current and voltage summed over the time the current and voltage are applied. Mathematically, energy is expressed as:

$$W = \int_0^T E(t)\ dt$$

Where: W = Energy
E(t) = Voltage as a function of Time
I(t) = Current as a function of Time

Ohm's law can be expressed by the following equation:

$E(t) = I(t)R$ Where R = Resistance in ohms

Since the resistance is known (50 ohms), the two equations can be combined to give the following relationship for energy:

$$W = \int_0^T R\ I^2(t)\ dt$$

The Model QED-III divides down the input current and uses less than 1/1000 of the current supplied by the defibrillator for its measurement. As described by the mathematical expression, the QED-III squares the input current using a current squaring network and sums up (integrates) the current using a precision integrated circuit while at the same time multiplying by a constant (R) to provide the exact energy of the applied pulse.

8.2 SPECIFICATIONS

Model QED-III is designed for use with D.C. and A.C. defibrillators and sums the negative and positive output energies.

Results: Displayed in watt-seconds (joules)

Display Capability: Large 4 1/2" meter

Input Impedance: 50 ohms +/-1%

Accuracy: ±2% of full scale for all waveforms, including long trapezoidal waveforms to 50 milliseconds in

duration and high voltage pulses to 7000 volts in amplitude.

Accuracy can be improved for specific waveforms.

Ranges: 0-50.0 watt-seconds; 1 watt-second increments
0-500 watt-seconds; 10 watt-second increments
0-1000 watt-seconds; 20 watt-second increments

Reading duration: Indefinite (controlled by left plate)

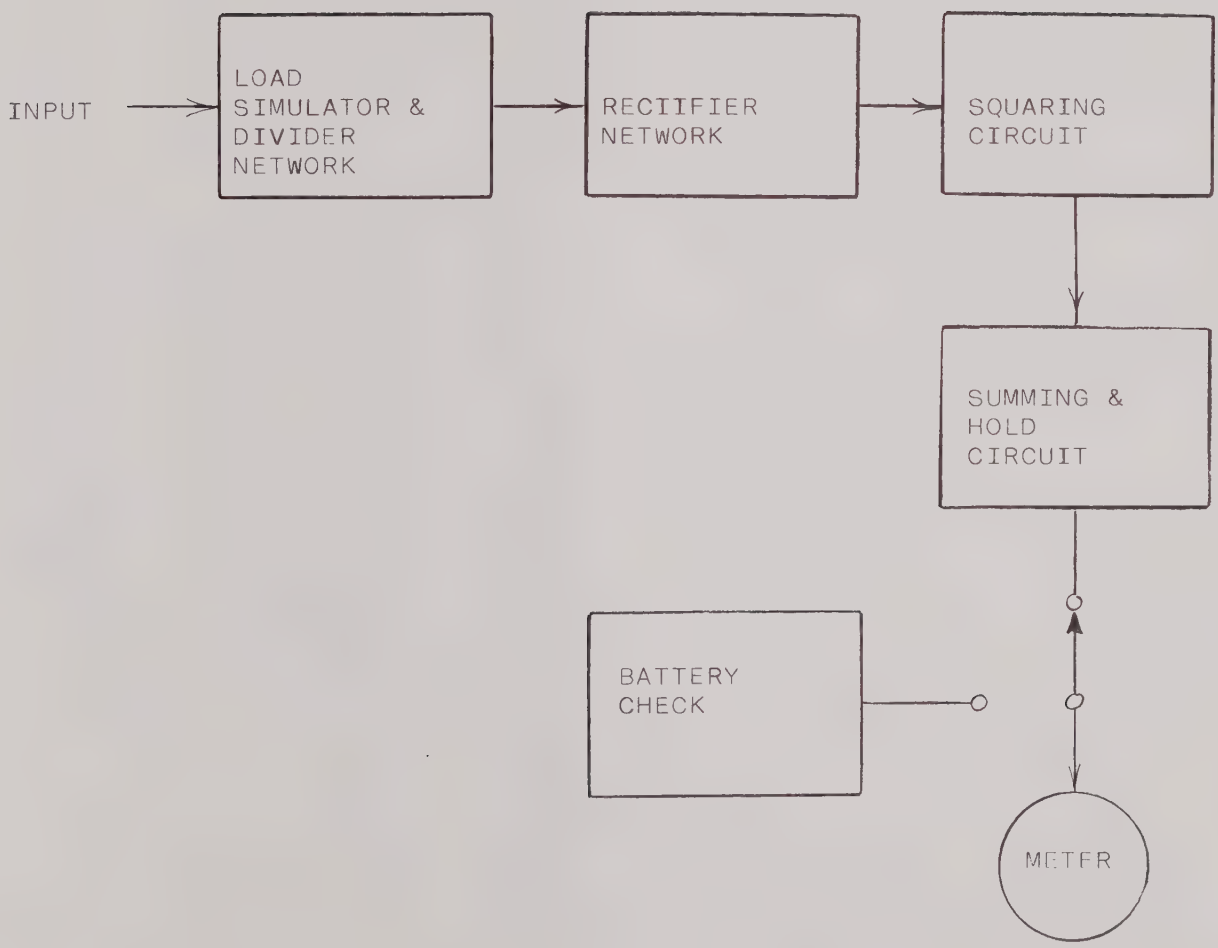
Power: 4 each, 9 volt transistor batteries (Mallory TR146X or equivalent recommended)

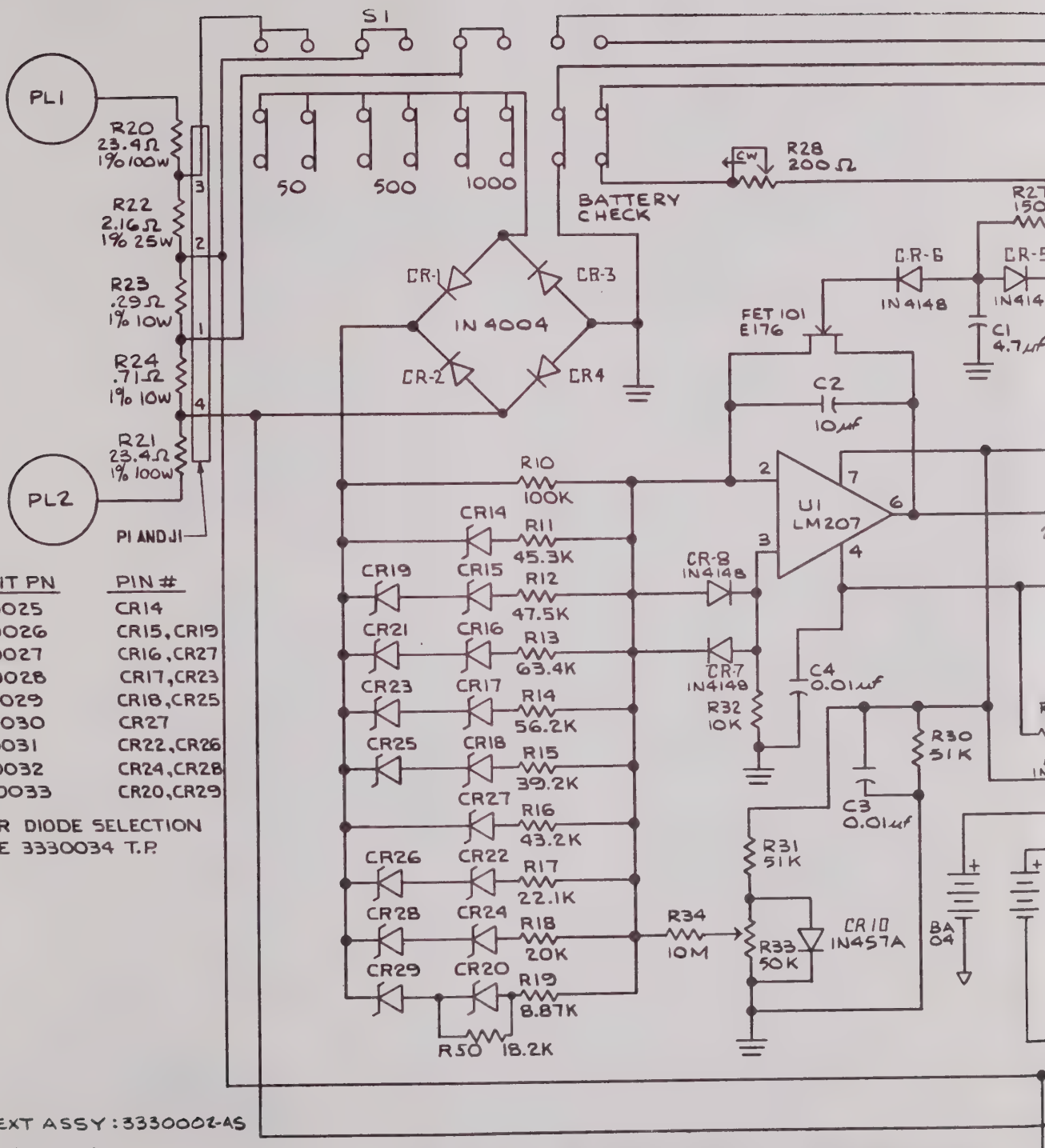
Expected Battery Life: Greater than one year

Waveform Display Capability: 2 female banana jacks for oscilloscope; attenuation is 1:10,000 of input waveform; isolated through an opto-isolator.

Dimensions: Height: 127mm/5"
Width: 370mm/14 3/8"
Depth: 240mm/8 3/4"
Weight: 3.6Kg/8 1 lbs.

BLOCK DIAGRAM





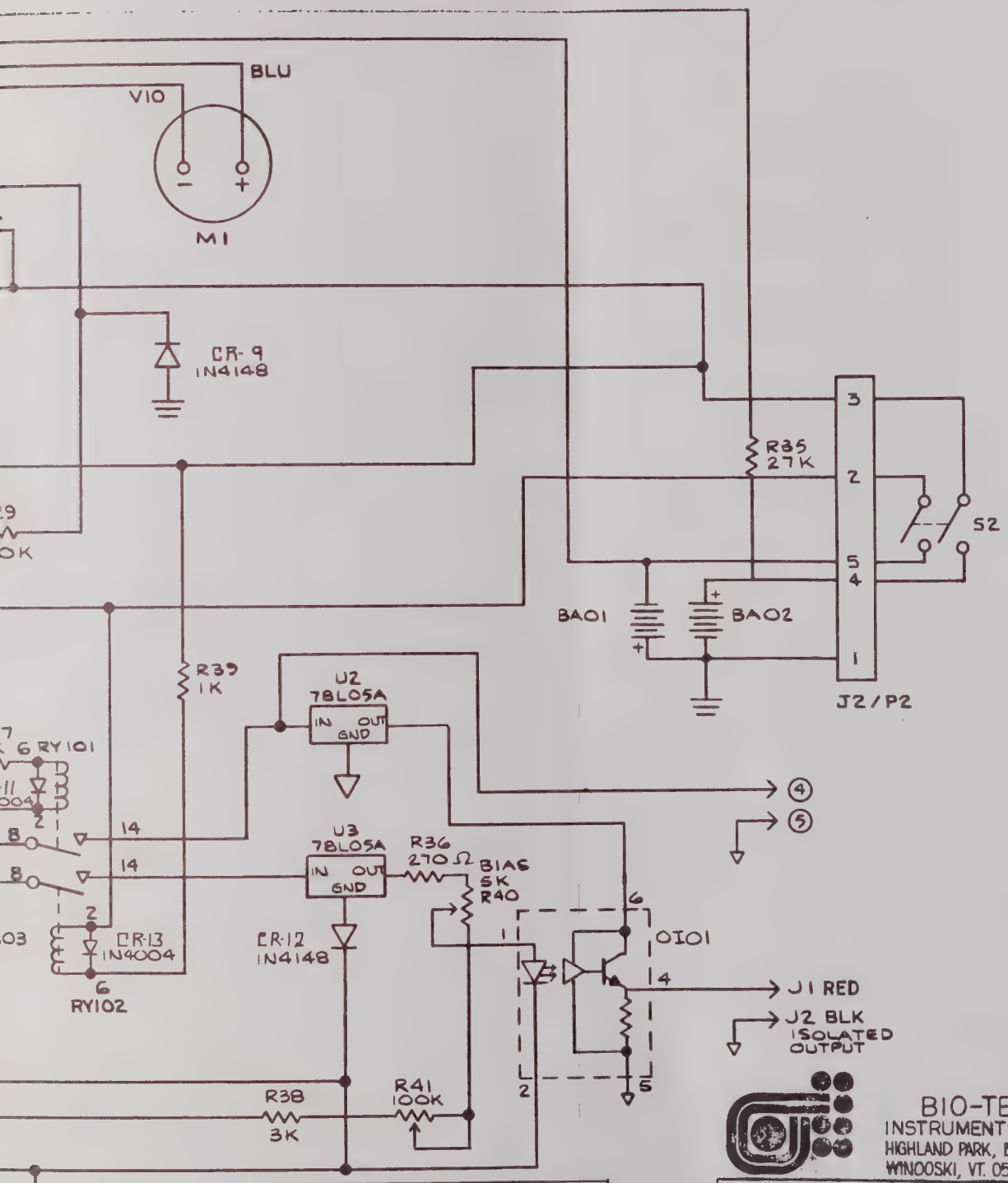
7 DIGIT PN	PIN #
3330025	CR14
3330026	CR15, CR19
3330027	CR16, CR27
3330028	CR17, CR23
3330029	CR18, CR25
3330030	CR27
3330031	CR22, CR26
3330032	CR24, CR28
3330033	CR20, CR29

FOR DIODE SELECTION SEE 3330034 T.P.

NEXT ASSY: 3330002-AS

① ② ④ ⑤ FOR QED-III SYNC. TEST OPTION ONLY

REV	DESCRIPTION	ECO	DATE	BY
G	CH. R20, 21; CH. J1 TO RED	3688	6/27/86	SF
E	NEW ADDRESS	3516	5-29-86	PEB
E	REV. PER E.C.O.	3409	5-12-86	JR



REV	DESCRIPTION	DATE/BY
D	REV PER ECO 3267	4/19/86
C	REV PER ECO 494	12/18/82
B	REV PER ECO 454	9/28/82 SD
A	RELEASE TO PRODUCTION PER ECO 000187	8/11/82

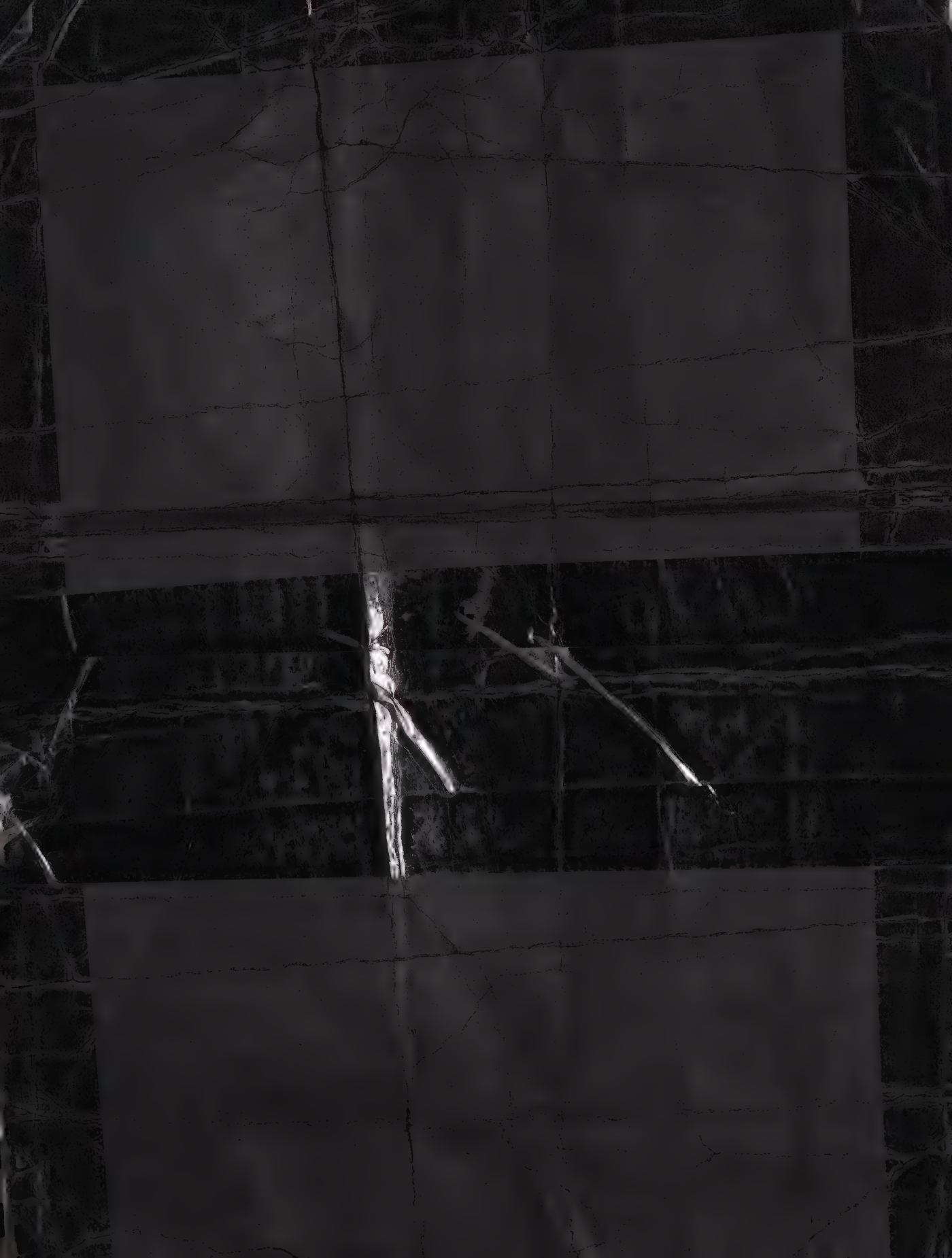
SCALE NONE | SHEET 1 OF 1

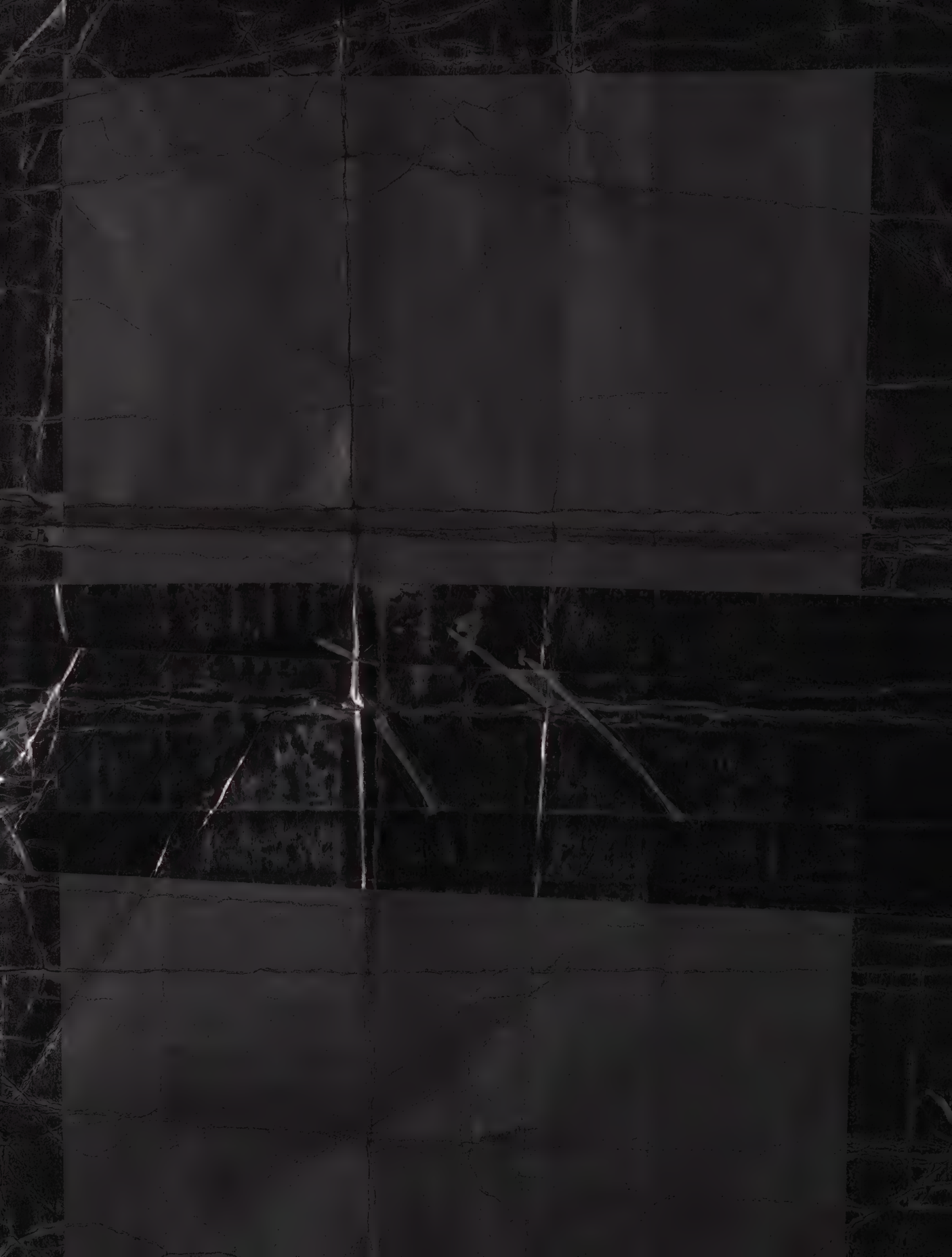
DRAWN Ballard 5 Mar 81 | CHK'D PGutwin 13 Mar 81

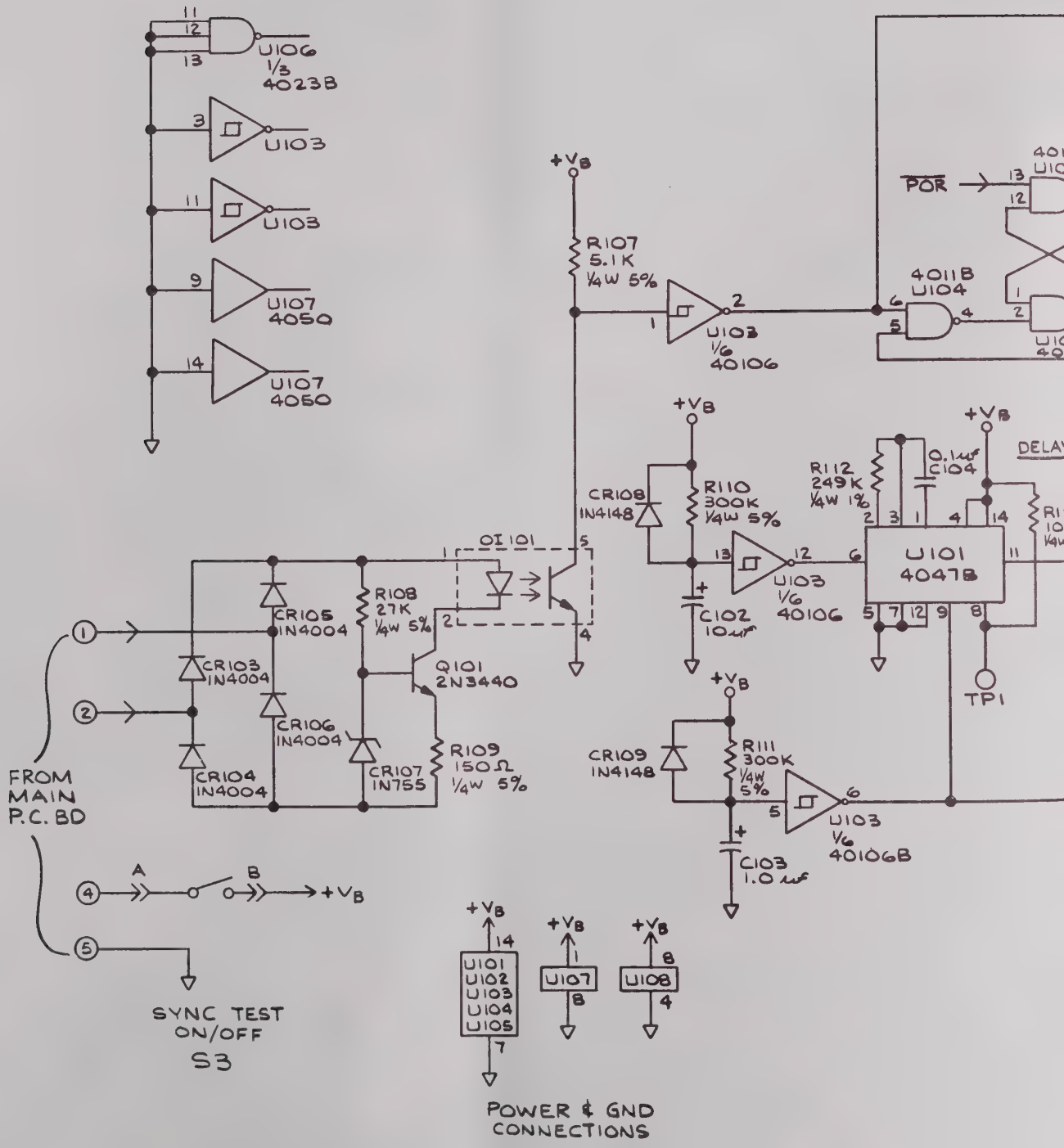
MAIN SWITCH P.C. BOARD
SCHEMATIC, QED III

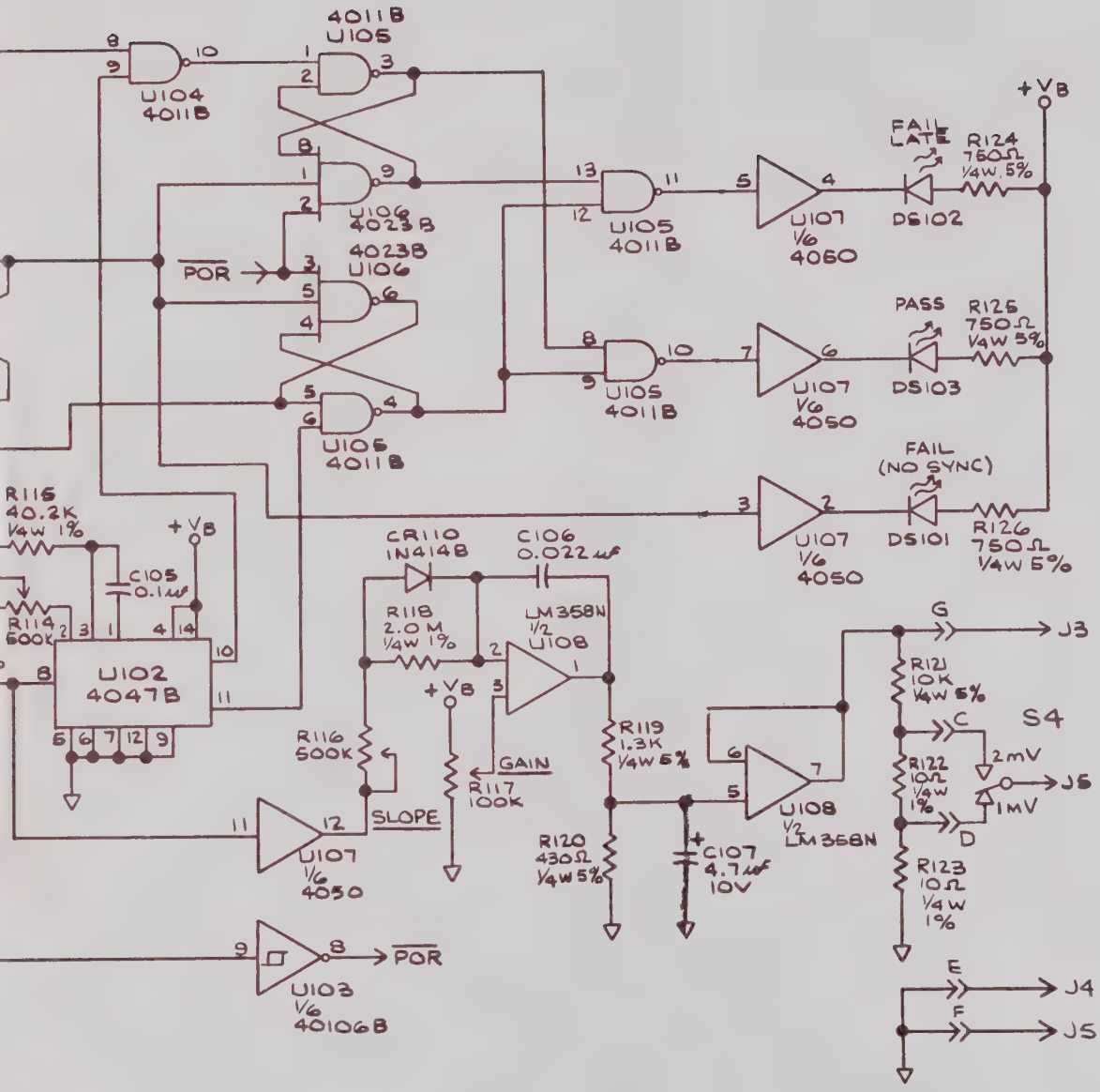
DWG NO 3330008-SC

BIO-TEK
INSTRUMENTS, INC.
HIGHLAND PARK, BOX 998
WINOOSKI, VT. 05404-0998






U106
1/3
4023B
U103
U103
U107
4050
U107
4050
+VB
R107
5.1K
1/4W 5%
U103
1/6
40106
POR
4011B
U104
R112
249K
1/4W 1%
0.1uf
C104
U101
4047B
R110
300K
1/4W 5%
CR108
IN4148
U103
1/6
40106
C102
10uf
OI 101
R108
27K
1/4W 5%
CR105
IN4004
CR103
IN4004
CR106
IN4004
CR104
IN4004
CR107
IN755
Q101
2N3440
R109
150Ω
1/4W 5%
FROM
MAIN
P.C. BD
TP1
CR109
IN4148
R111
300K
1/4W
5%
U103
1/6
40106B
C103
1.0uf
A
B
+VB
SYNC TEST
ON/OFF
S3
U101
U102
U103
U104
U105
U107
U108
POWER & GND
CONNECTIONS



BIO-TEK INSTRUMENTS, INC.
HIGHLAND PARK, BOX 998
WINOOSKI, VT. 05404-0998

REV	DESCRIPTION	DATE/BY
D	REV PER ECO 000226	4/5/82
C	RELEASE TO PRODUCTION PER ECO 000187	3/1/82
B	REV PER ECO 000157	2/18/82
A	REV PER ECO 000049	11/2/81

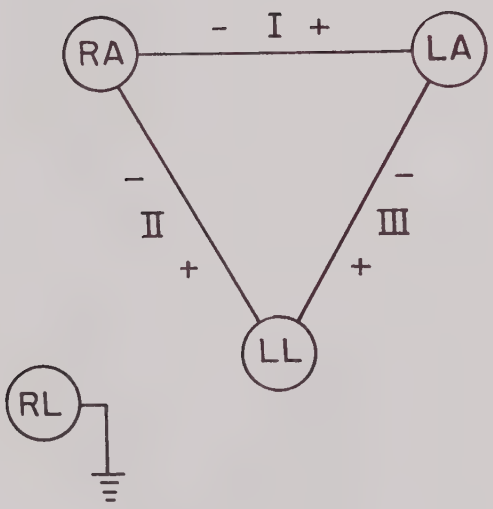
SCALE NONE
SHEET 1 OF 1

SYNC. TEST SCHEMATIC
QED III

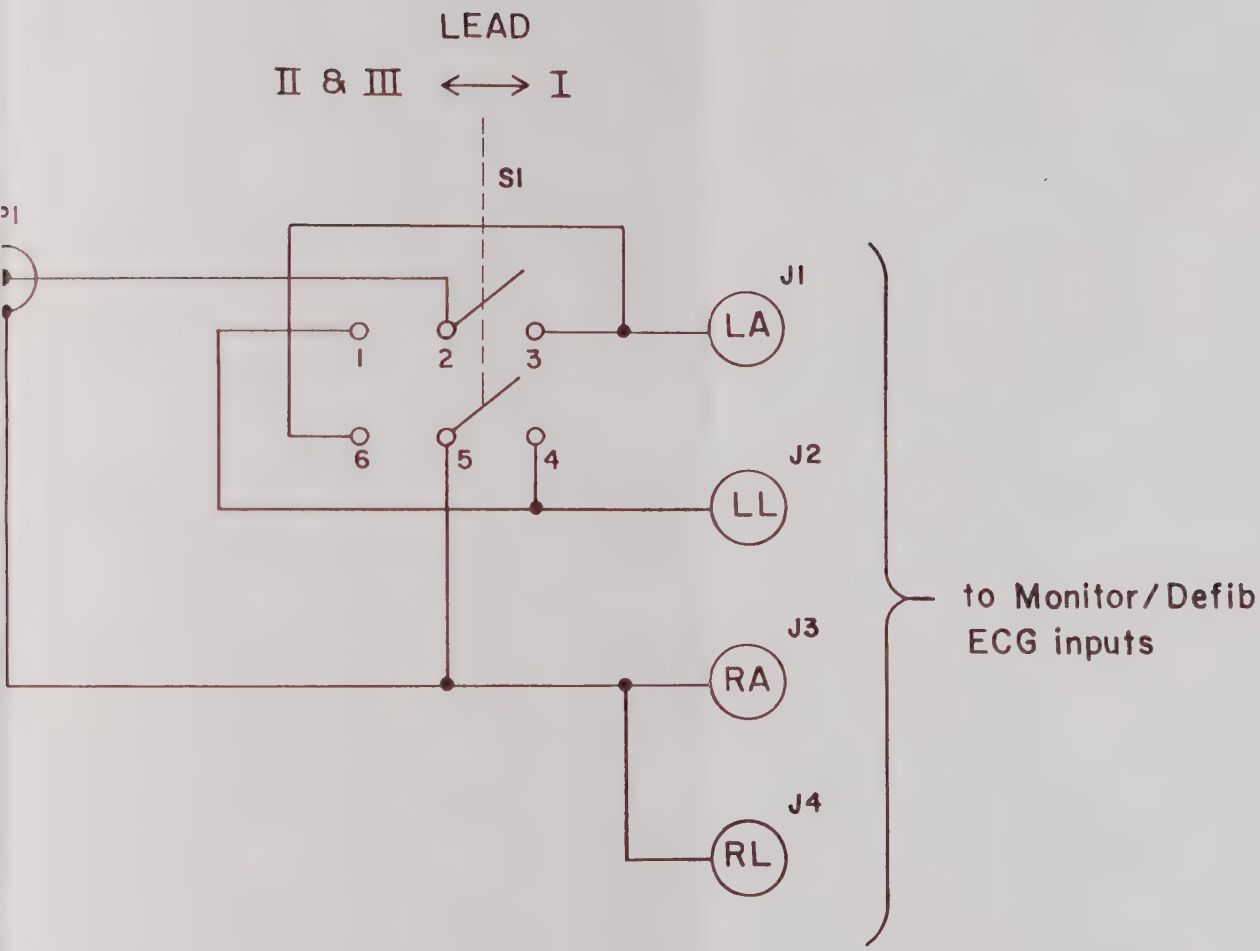
DRAWN 12/4/81
CHK'D 12/4/81

DWG NO 3340005-SC

from
QED III S
"R Wave"



B	CHANGE NO. TO 3340012-SC
A	RELEASE TO PRODUCTION
REV	DESCRIPTION



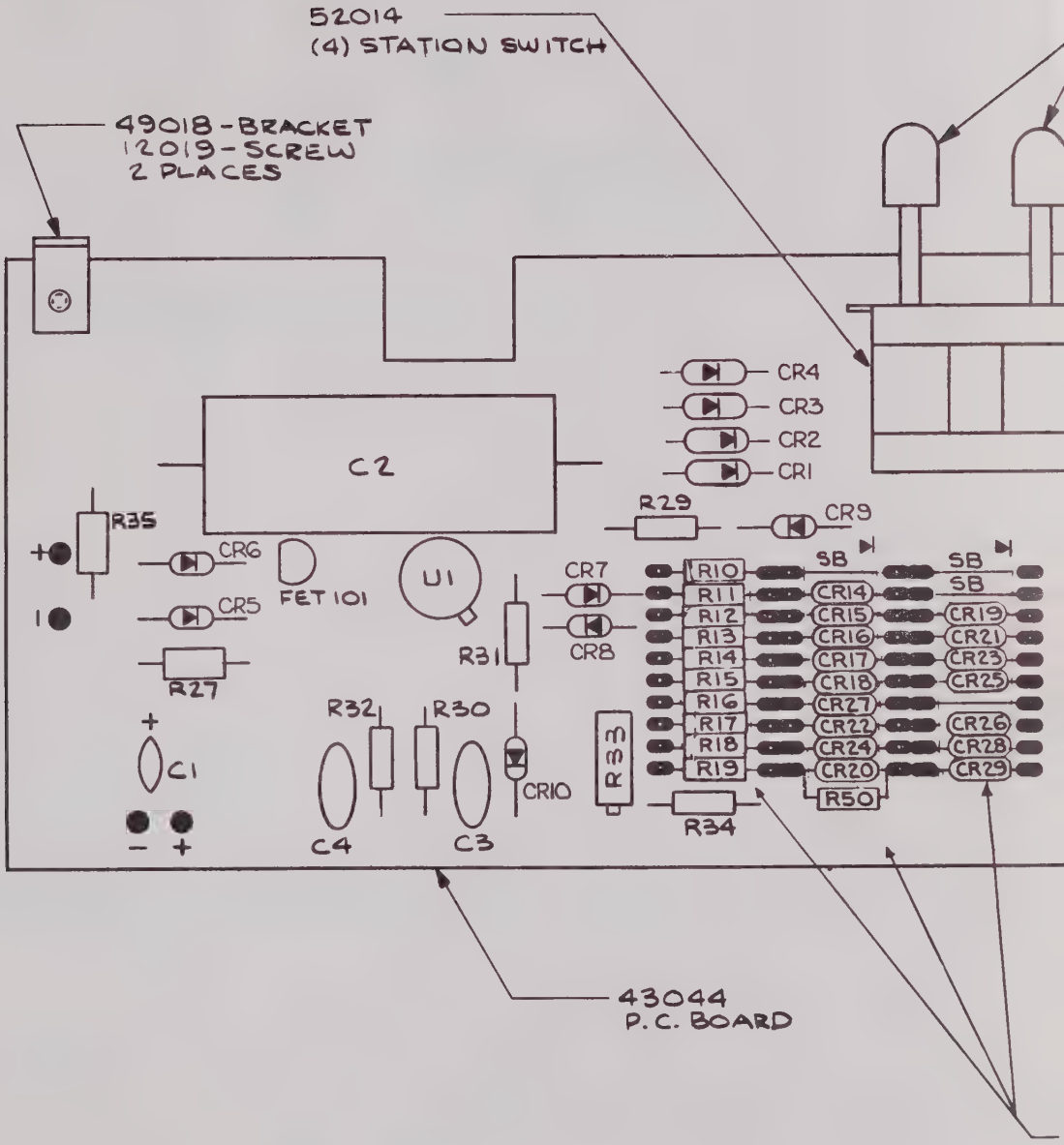
BIO-TEK
INSTRUMENTS, INC.
HIGHLAND PARK, BOX 998
WINOOSKI, VT 05404-0998

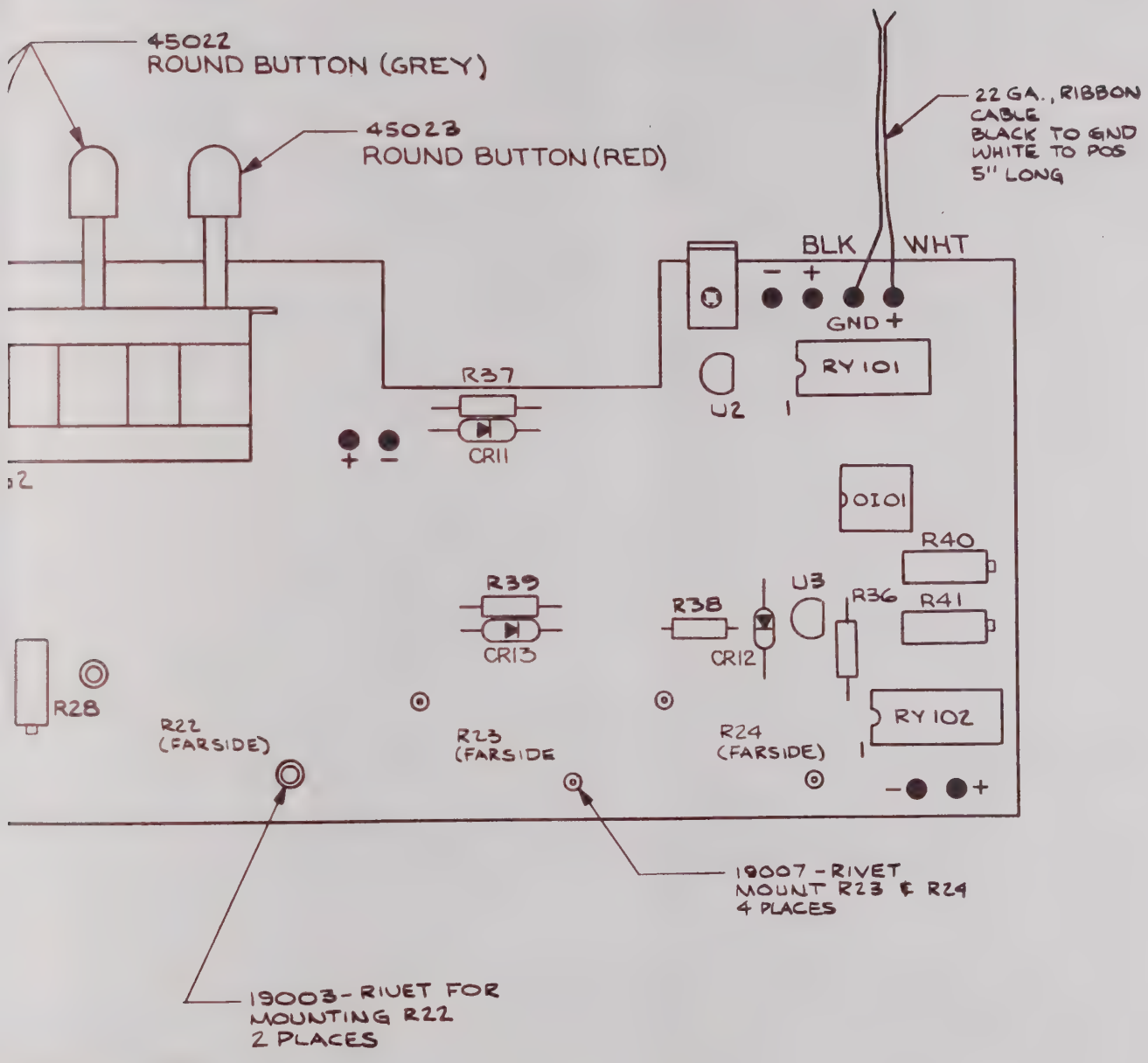
	4/15/82	JB
37	3/1/82	JB
ECO	DATE	BY

APPROVALS	DATE
DRAWN	
CHECKED	

QED III
ECG LEAD ADAPTER
SCHEMATIC

SCALE NA	DRAWING NO. 3340012-SC
SHEET 1 OF 1	


52014
(4) STATION SWITCH
49018 - BRACKET
12019 - SCREW
2 PLACES
CR4
CR3
CR2
CR1
C2
R35
CR6
CR5
R27
FET 101
U1
R31
CR7
CR8
R29
CR9
SB
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
CR14
CR15
CR16
CR17
CR18
CR27
CR22
CR24
CR20
CR19
CR21
CR23
CR25
CR26
CR28
CR29
R50
R34
R33
R32
R30
CR10
C1
C4
C3
43044
P.C. BOARD



ESISTOR & DIODE
QUARING CIRCUIT

REV	DESCRIPTION	DATE/BY
J	47032(2)	
I	Delete PCB number ECO 3688	6/27/86
H	REVISE PER ECO 3516	5-29-86
G	CHANGE 45022 TO ROUND BUTTON	5-16-86
F	CHANGE 4 STATION SWITCH ECO PIN FROM 42014 TO 82014 1313	7/10/84
E	ADD SQUARING CIR. ECO 819	7/19/83
D	REV PER ECO 000454	9/28/82
C	REV PER ECO 000286	2/ /82
B	RELEASE TO PRODUCTION PER ECO 000187	3/1/82
A	REV PER ECO 000165	12/29/81

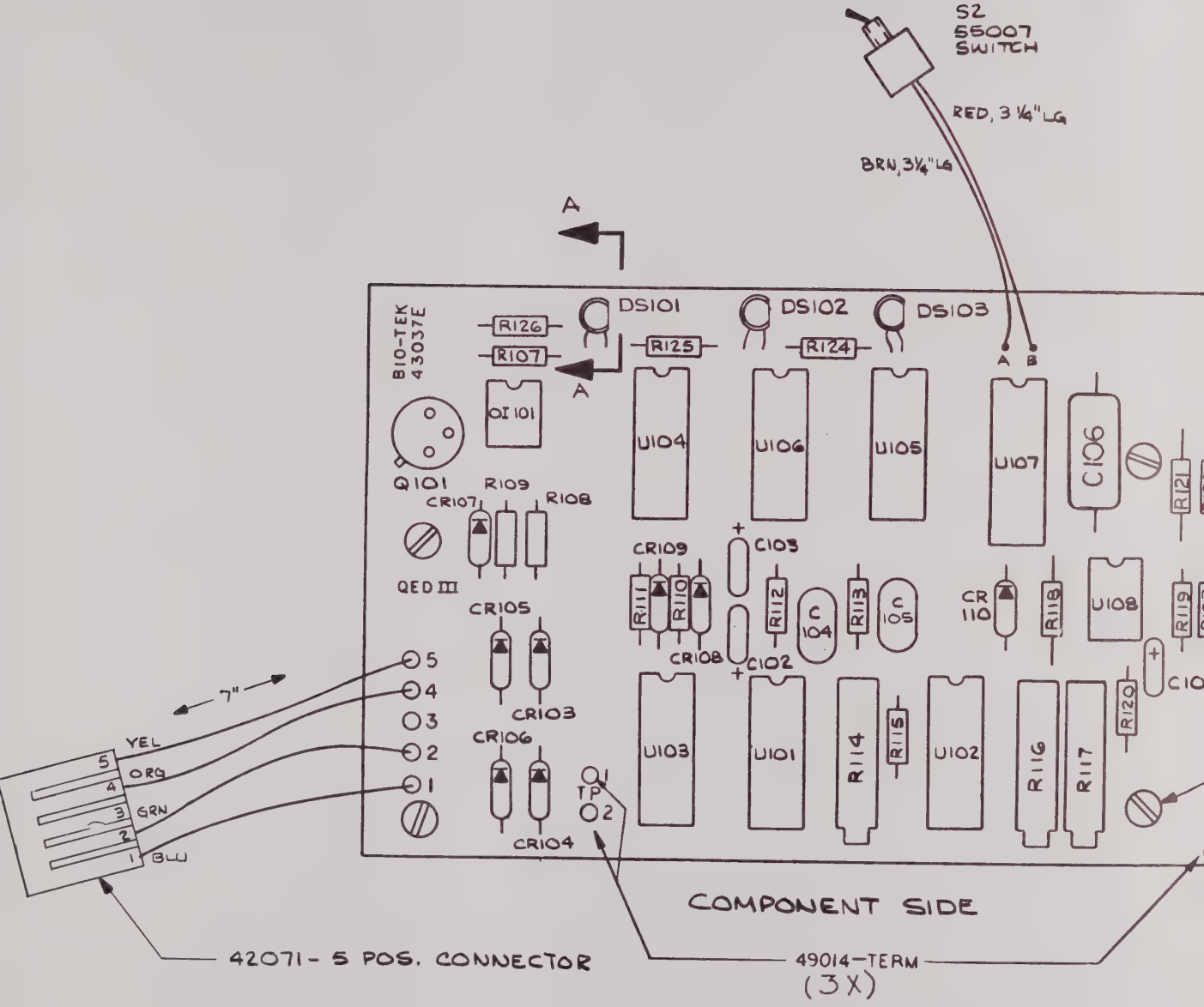
SCALE: 2/1
SHEET 1 OF 2

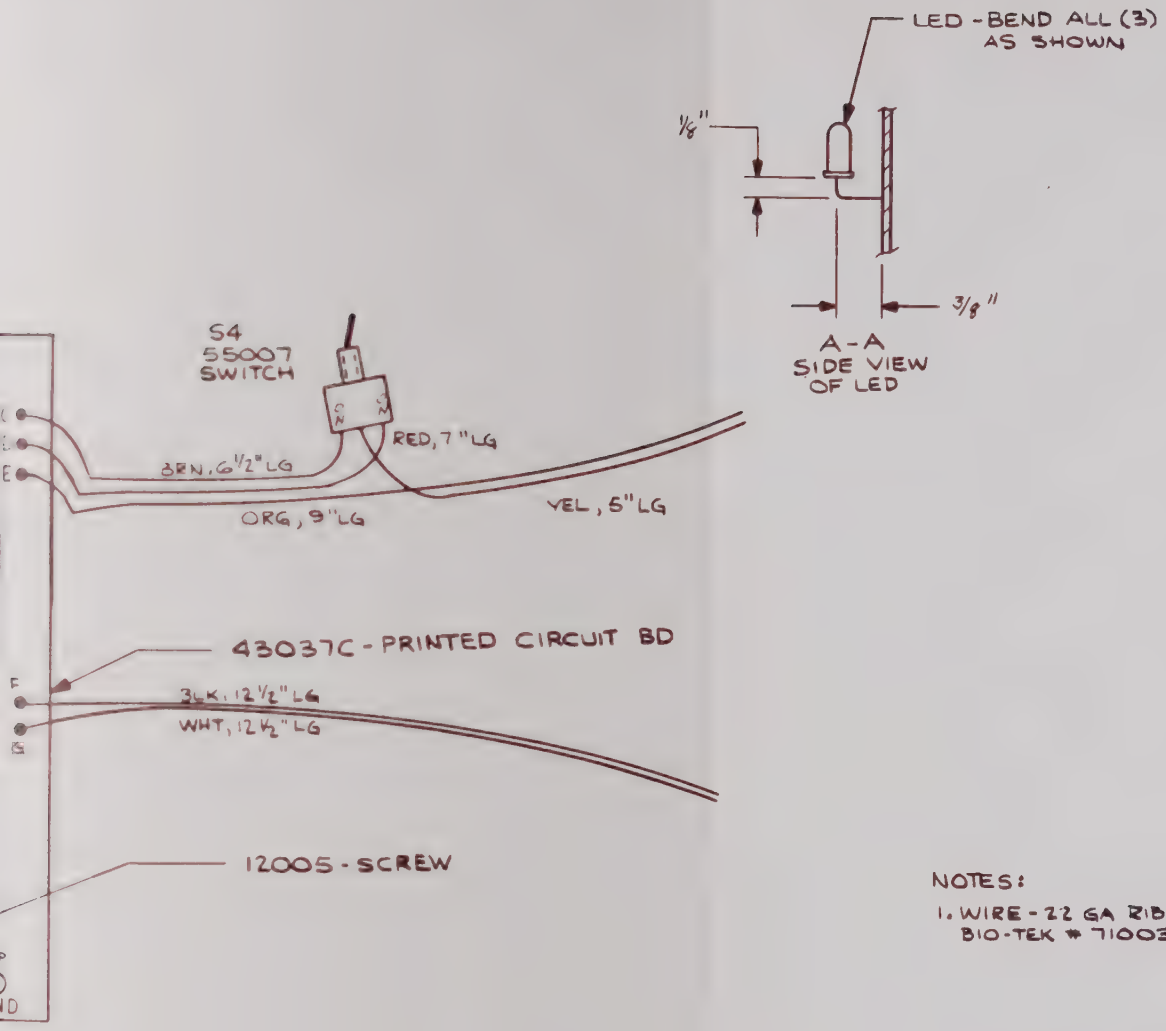
BIO-TEK
INSTRUMENTS, INC.
HIGHLAND PARK, BOX 998
WINOOSKI, VT. 05404-0998

MAIN SWITCH RC. BD ASSY - QED III
(COMPONENT LAYOUT)
TOP SIDE

DRAWN 3/16/81
CHK'D 16 MAR 81

DWG NO
3330002-AS


S2
55007
SWITCH
RED, 3 1/4" LG
BRN, 3 1/4" LG
A
A
A
B
BIO-TEK
43037E
DS101
DS102
DS103
R126
R107
R125
R124
OI 101
Q101
U104
U106
U105
U107
C106
R121
R109
CR107
R108
QED III
CR109
C103
R111
R110
R112
C104
R113
C105
CR110
R118
U108
R119
CR105
CR108
C102
CR103
CR106
TP
O1
O2
U103
U101
R114
R115
U102
R116
R117
R120
C10
5
4
3
2
1
7"
YEL
ORG
GRN
BLU
CR104
COMPONENT SIDE
42071 - 5 POS. CONNECTOR
49014 - TERM
(3X)



NOTES:

1. WIRE - 22 GA RIBBON CABLE BIO-TEK # 71003

SEE SEPARATE PARTS LIST

NEXT ASSY: 3340001-AS

SCHEMATIC: 3340005-SC

REV	DESCRIPTION	DATE/BY
L	ADD ARROW TO TP1 LABEL GND AS TP ADD "3X" TO 43014-TERM 5107	9 25 86 BK
K	CHANG TO NEW ART. ECO 1385	7/11/84 SD
J	REV PER ECO 000466	10/5/83 SD
I	REV PER ECO 000815	4 JUN 82 SD
H	REV PER ECO 000226	4/6/82 SD
G	REV PER ECO 000212	11 MAR 82 SD
F	REV PER ECO 000186	2/23/82 SD
E	RELEASE TO PRODUCTION PER ECO 000157	2/22/82 SD
D	REV PER ECO 000157	2/10/82 SD
C	REV PER ECO 000049	11/30/81 SD
B	REV PER ECO 000103	26 NOV 81 SD

SCALE 2/1

SHEET 1 OF 1

DRAWN: Garland 9 May 81

CHK'D: P Sutton 16 MAY 81

BIO-TEK INSTRUMENTS, INC.
HIGHLAND PARK. BOX 998
WINOOSKI, VT. 05404-0998

SYNC. TEST BD ASSY-QED III
(COMPONENT SIDE)

DWG NO 3340004-AS

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KITTING LIST

3330001 333 QED-III FRONT PANEL RUN # QTY: 1

PART #	DESCRIPTION	REFERENCE	MEMO CODE	QTY	EXT	ISSUES
*	*** REVISION LEVEL ***	E 12-30-84	99	.00	.00	
11007	SCR FH 4-40x5/8 SS SLOT		2	2.00	2.00	
12004	SCR PAN 4-40x1/4 SS SLOT		2	14.00	14.00	
12013	SCR PAN 8-32x1/2 SS SLOT		2	4.00	4.00	
12025	SCR PAN 2-56x5/8 SS SLOT		2	2.00	2.00	
14002	NUT HEX 2-56 BRASS 1/8"AF		2	2.00	2.00	
14006	NUT HEX 10-32 SS		2	2.00	2.00	
15002	LOCKNUT 4-40 STEEL		2	2.00	2.00	
15004	LOCKNUT 8-32 SS		2	4.00	4.00	
15006	LOCKNUT 10-32 STEEL		2	2.00	2.00	
33045	RES 23.40 OHM 1% 100W	R20,21	8	2.00	2.00	
3330002	333 QED-III PCB MAIN SW		1	1.00	1.00	
3330006	SUB-PANEL QED-III/S FRONT		90	1.00	1.00	
3330019	SUB-PANEL QED-III/S MOUNT		90	1.00	1.00	
3330020	SUB-PANEL QED-III/S		90	1.00	1.00	
3330021	BRACKET QED-III SW		10	1.00	1.00	
42001	BANANA JACK RED	J1	6	1.00	1.00	
42002	BANANA JACK BLACK	J2	6	1.00	1.00	
42027	TERM RING #8 16-14 GA INS		6	2.00	2.00	
44020	PLATE QED-III CONTACT		8	2.00	2.00	

11/18/86 BILL OF MATERIAL PAGE 2

KITTING LIST

3330001 333 QED-III FRONT PANEL RUN # QTY: 1

PART #	DESCRIPTION	REFERENCE	MEMO CODE	QTY	EXT	ISSUES
44077	OVERLAY QED-III FRONT		8	1.00	1.00	
47002	BATTERY 9V ALKALINE	BA1-4	6	4.00	4.00	
47004	BATTERYHOLDER		2	4.00	4.00	
49008	SPACER THRU #4x.375 AL RD		2	2.00	2.00	
49048	CLIP SPRING LARGE		6	2.00	2.00	
52008	SW PB DPST KEYBOARD	S2	8	1.00	1.00	
92004	METER,MADC (QED III)	M1	12	1.00	1.00	
92008	METER BEZEL		12	1.00	1.00	

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KITTING LIST

3330002 333 QED-III PCB MAIN SW RUN # QTY: 1

PART #	DESCRIPTION	REFERENCE	MEMO CODE	QTY	EXT	ISSUES
*	*** REVISION LEVEL ***	J 10-16-86	99	.00	.00	
12019	SCR PAN 4-40x3/16 SS SLOT		2	2.00	2.00	
19003	RIVET POP 1/8D .060-.125G		2	2.00	2.00	
19007	RIVET POP AL HEAD/ST SHNK		2	4.00	4.00	
21001	DIODE 1N457A	CR10	2	1.00	1.00	
21003	DIODE 1N4004 1A 200V	CR-4,11,13	2	6.00	6.00	
21004	DIODE 1N4148 SIGNAL	CR5-9,12	2	6.00	6.00	
22001	DIODE 1N5240B ZENER 10V	CR20	6	1.00	1.00	
22003	DIODE 1N5254B ZENER 27V	CR26	6	1.00	1.00	
22004	DIODE 1N5258B ZENER 36V	CR28	6	1.00	1.00	
22009	DIODE 1N5245B ZENER 15V	CR22,23	6	2.00	2.00	
22015	DIODE 1N5232B ZENER 5.6V	CR1835	6	1.00	1.00	
22017	DIODE 1N5231B ZENER 5.1V	CR17	6	1.00	1.00	
22025	DIODE 1N5249B ZENER 19V	CR24,25	6	2.00	2.00	
23009	OP AMP 207 PRECISION	U1	8	1.00	1.00	
23026	VOLT REG +5V 78L05A	U2,3	8	2.00	2.00	
27002	TRANSISTOR 176 FET P-CH	FET101	8	1.00	1.00	
28001	OPTO ISOLATOR	OI1	8	1.00	1.00	
31102	RES 1.0K OHM 5% 1/4W	R39,37	2	2.00	2.00	
31103	RES 10.0K OHM 5% 1/4W	R32	2	1.00	1.00	

11/18/86 BILL OF MATERIAL PAGE 2

KITTING LIST

3330002 333 QED-III PCB MAIN SW RUN # QTY: 1

PART #	DESCRIPTION	REFERENCE	MEMO CODE	QTY	EXT	ISSUES
31106	RES 10.0M OHM 5% 1/4W	R34	2	1.00	1.00	
31154	RES 150.0K OHM 5% 1/4W	R27	2	1.00	1.00	
31271	RES 270.0 OHM 5% 1/4W	R36	2	1.00	1.00	
31273	RES 27.0K OHM 5% 1/4W	R35	2	1.00	1.00	
31302	RES 3.0K OHM 5% 1/4W	R38	2	1.00	1.00	
31513	RES 51.0K OHM 5% 1/4W	R30,31	2	2.00	2.00	
32018	RES 39.20K OHM 1% 1/4W	R15	2	1.00	1.00	
32022	RES 43.20K OHM 1% 1/4W	R16	2	1.00	1.00	
32024	RES 45.30K OHM 1% 1/4W	R11	2	1.00	1.00	
32026	RES 47.50K OHM 1% 1/4W	R12	2	1.00	1.00	
32030	RES 100.00K OHM 1% 1/4W	R10	2	1.00	1.00	
32044	RES 20.00K OHM 1% 1/4W	R18	2	1.00	1.00	
32066	RES 22.10K OHM 1% 1/4W	R17	2	1.00	1.00	
32088	RES 18.20K OHM 1% 1/4W	R50	2	1.00	1.00	
32096	RES 1.78K OHM 1% 1/4W	R29	2	1.00	1.00	
32104	RES 56.20K OHM 1% 1/4W	R14	2	1.00	1.00	
32109	RES 63.40K OHM 1% 1/4W	R13	2	1.00	1.00	
32145	RES 8.87K OHM 1% 1/4W	R19	2	1.00	1.00	
33027	RES .707 OHM 1% 10W	R24	8	1.00	1.00	
33028	RES .293 OHM 1% 10W	R23	8	1.00	1.00	

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KITTING LIST

3330002 333 QED-III PCB MAIN SW RUN # QTY: 1

PART #	DESCRIPTION	REFERENCE	MEMO CODE	QTY	EXT	ISSUES
33029	RES 2.16 OHM 1% 2SW	R22	8	1.00	1.00	
3330025	ZenerDiode 5.1vCR14*22017	CR14	8	1.00	1.00	
3330026	ZenDi CR15&19*22017&22015	CR15,19	8	1.00	1.00	
3330027	ZenDi CR16&21*22017&22001	CR16,21	8	1.00	1.00	
3330030	ZenDi CR27 - 22036	CR27	8	1.00	1.00	
3330033	ZenDi CR20&29*22001&22037	CR29	8	1.00	1.00	
34003	TRIMPOT 200 OHM, 10T	R28	6	1.00	1.00	
34006	TRIMPOT 50K, 10T	R33	6	1.00	1.00	
34007	TRIMPOT 100K, 10T	R41	6	1.00	1.00	
34008	TRIMPOT 5K, 10T	R40	6	1.00	1.00	
42017	TERM RING #10 22-18 GA		2	2.00	2.00	
42039	HEDR 10-P .156 LOK		6	1.00	1.00	
42050	HEDR 5-P .156 LOK		6	1.00	1.00	
42071	INDS 5-S .156 22 GA		6	2.00	2.00	
43044	PCB QED-III	REV E	8	1.00	1.00	
45022	BUTTON ROUND GREY		2	3.00	3.00	
45023	BUTTON ROUND RED		2	1.00	1.00	
47005	BATTERYCLIP 9V		6	4.00	4.00	
49018	BRACKET RIGHT ANGLE		2	2.00	2.00	
49021	SOCKET I.C. 8-PIN DIP		6	1.00	1.00	

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KITTING LIST

3330002 333 QED-III PCB MAIN SW RUN # QTY: 1

PART #	DESCRIPTION	REFERENCE	MEMO CODE	QTY	EXT	ISSUES
49028	SPACER DOG BONE .093"H		2	3.00	3.00	
52014	SW PB 4-STA 2-POLE	S1	8	1.00	1.00	
62002	RELAY SPST DIP REED	RY101,102	98	2.00	2.00	
82001	CAP 4.7 uF 10V TANT	C1	8	1.00	1.00	
83007	CAP .01 uF 50V DISC	C3,4	2	2.00	2.00	
84011	CAP 10 uF 100V FILM	C2	8	1.00	1.00	

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KITTING LIST

3330015 333 QED-III FINAL ASBY RUN # QTY: 1

PART #	DESCRIPTION	REFERENCE	MEMO CODE	QTY	EXT	ISSUES
*	*** REVISION LEVEL ***	D 5-21-84	99	.00	.00	
12035	SCR PAN 6-32x3/4 BLK SS S		2	4.00	4.00	
3330001	333 QED-III FRONT PANEL		1	1.00	1.00	
3330017	333 QED-III SHIPPING LIST		1	1.00	1.00	
44018	CASE QED-III,301A FORMICA		12	1.00	1.00	
44125	OVERLAY QED-III SHRT INST		8	1.00	1.00	
93021	LABEL SER# 1-1/2x5/8		2	1.00	1.00	

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KITTING LIST

3340001 334 QED-IIIS FRONT PANEL RUN # QTY: 1

PART #	DESCRIPTION	REFERENCE	MEMO CODE	QTY	EXT	ISSUES
*	*** REVISION LEVEL ***	E 12-30-84	99	.00	.00	
11007	SCR FH 4-40x5/8 SS SLOT		2	2.00	2.00	
12004	SCR PAN 4-40x1/4 SS SLOT		2	14.00	14.00	
12005	SCR PAN 4-40x3/8 SS SLOT		2	4.00	4.00	
12013	SCR PAN 8-32x1/2 SS SLOT		2	4.00	4.00	
12025	SCR PAN 2-56x5/8 SS SLOT		2	2.00	2.00	
14002	NUT HEX 2-56 BRASS 1/8"AF		2	2.00	2.00	
14006	NUT HEX 10-32 SS		2	2.00	2.00	
15002	LOCKNUT 4-40 STEEL		2	2.00	2.00	
15004	LOCKNUT 8-32 SS		2	4.00	4.00	
15006	LOCKNUT 10-32 STEEL		2	2.00	2.00	
18004	NUT 4-40 B/W NYLON		2	4.00	4.00	
33045	RES 23.40 OHM 1% 100W	R20,21	8	2.00	2.00	
3330002	333 QED-III PCB MAIN SW		1	1.00	1.00	
3330006	SUB-PANEL QED-III/S FRONT		90	1.00	1.00	
3330019	SUB-PANEL QED-III/S MOUNT		90	1.00	1.00	
3330020	SUB-PANEL QED-III/S		90	1.00	1.00	
3330021	BRACKET QED-III SW		10	1.00	1.00	
3340004	334 QED-IIIS PCB SYNCTEST		1	1.00	1.00	
42001	BANANA JACK RED	J1,3	6	2.00	2.00	

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KITTING LIST

3340001 334 QED-IIIS FRONT PANEL RUN # QTY: 1

PART #	DESCRIPTION	REFERENCE	MEMO CODE	QTY	EXT	ISSUES
42002	BANANA JACK BLACK	J2,4	6	2.00	2.00	
42006	BNC CHASSIS SINGLE		6	1.00	1.00	
42027	TERM RING #8 16-14 GA INS		6	2.00	2.00	
42031	TERM RING 3/8 22-16 GA		2	1.00	1.00	
44020	PLATE QED-III CONTACT		8	2.00	2.00	
44078	OVERLAY QED-IIIS FRONT		8	1.00	1.00	
47002	BATTERY 9V ALKALINE	BA1-4	6	4.00	4.00	
47004	BATTERYHOLDER		2	4.00	4.00	
49008	SPACER THRU #4x.375 AL RD		2	2.00	2.00	
49048	CLIP SPRING LARGE		6	2.00	2.00	
52008	SW PB DPST KEYBOARD	S2	8	1.00	1.00	
92004	METER,MADC (QED III)	M1	12	1.00	1.00	
92008	METER BEZEL		12	1.00	1.00	

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KITTING LIST

3340004 334 QED-IIIS PCB SYNCTEST RUN # QTY: 1

PART #	DESCRIPTION	REFERENCE	MEMO CODE	QTY	EXT	ISSUES
*	*** REVISION LEVEL ***	H 4-17-85	99	.00	.00	
03002	LED RED		6	3.00	3.00	
12005	SCR PAN 4-40x3/8 SS SLOT		2	4.00	4.00	
21003	DIODE 1N4004 1A 200V	CR103-106	2	4.00	4.00	
21004	DIODE 1N4148 SIGNAL	CR108-110	2	3.00	3.00	
22029	DIODE 1N755 ZENER 7.5V10%	CR107	6	1.00	1.00	
23027	OP AMP 358 DUAL	U108	8	1.00	1.00	
25010	IC 4047 LP MONO/AS MUL	U101,102	8	2.00	2.00	
25011	IC 4023 NAND 3-IN TRIPLE	U106	8	1.00	1.00	
25015	IC 4050 HEX BUF/CONVERTER	U107	8	1.00	1.00	
25021	IC 4011 NAND 2-IN QUAD	U104,105	8	2.00	2.00	
25022	IC 40106 HEX SCHMITT TRIG	U103	8	1.00	1.00	
26006	TRANSISTOR 2N3440 BJT NPN	Q101	8	1.00	1.00	
28008	OPTO ISOLATOR	OI101	8	1.00	1.00	
31103	RES 10.0K OHM 5% 1/4W	R113,121	2	2.00	2.00	
31132	RES 1.3K OHM 5% 1/4W	R119	2	1.00	1.00	
31151	RES 150.0 OHM 5% 1/4W	R109	2	1.00	1.00	
31273	RES 27.0K OHM 5% 1/4W	R108	2	1.00	1.00	
31304	RES 300.0K OHM 5% 1/4W	R110,111	2	2.00	2.00	
31431	RES 430.0 OHM 5% 1/4W	R120	2	1.00	1.00	

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KITTING LIST

3340004 334 QED-IIIS PCB SYNCTEST RUN # QTY: 1

PART #	DESCRIPTION	REFERENCE	MEMO CODE	QTY	EXT	ISSUES
31512	RES 5.1K OHM 5% 1/4W	R107	2	1.00	1.00	
31751	RES 750.0 OHM 5% 1/4W	R124-126	2	3.00	3.00	
32019	RES 40.20K OHM 1% 1/4W	R115	2	1.00	1.00	
32034	RES 249.00K OHM 1% 1/4W	R112	2	1.00	1.00	
32052	RES 2.00M OHM 1% 1/4W	R118	2	1.00	1.00	
32099	RES 10.00 OHM 1% 1/4W	R122,123	2	2.00	2.00	
34007	TRIMPOT 100K, 10T	R117	6	1.00	1.00	
34012	TRIMPOT 500K, 10T	R114,116	6	2.00	2.00	
42071	INDS S-S .156 22 GA		6	1.00	1.00	
43037	PCB 100-SERIES SYNC TEST REV E		8	1.00	1.00	
49014	TERM PCB		2	2.00	2.00	
55007	SW TOGGLE SPDT 6A MIN GLD	S2,4	12	2.00	2.00	
82001	CAP 4.7 uF 10V TANT	C107	8	1.00	1.00	
82003	CAP 10 uF 25V TANT	C102	8	1.00	1.00	
82005	CAP 1 uF 35V TANT	C103	8	1.00	1.00	
84013	CAP .1 uF 100V FILM	C104,105	8	2.00	2.00	
85011	CAP .022 mF 35V 2.5%	C106	8	1.00	1.00	

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KITTING LIST

3340011 334 QED-IIIS ECG LEAD ADP RUN # QTY: 1

PART #	DESCRIPTION	REFERENCE	MEMO CODE	QTY	EXT	ISSUES
*	*** REVISION LEVEL ***	D 5-21-84	99	.00	.00	
12029	SCR PAN 6-32x5/16 SS SLOT		2	4.00	4.00	
3340008	CASE LEAD AD *44029		90	1.00	1.00	
42006	BNC CHASSIS SINGLE	P1	6	1.00	1.00	
42016	TERM RING #6 22-16 GA		6	4.00	4.00	
42031	TERM RING 3/8 22-16 GA		2	1.00	1.00	
44028	OVERLAY ECG LEAD ADAPTER		8	1.00	1.00	
48041	ADAPTER ECG	J1-4	6	4.00	4.00	
48042	ADAPTER RETAINER ECG	J1-4	6	4.00	4.00	
55004	SW TOGGLE DPDT 3A MINI	S1	12	1.00	1.00	
7770017	WSHR CHANNEL		90	2.00	2.00	

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KITTING LIST

3340015 334 QED-IIIS FINAL ASBY RUN # QTY: 1

PART #	DESCRIPTION	REFERENCE	MEMO CODE	QTY	EXT	ISSUES
*	*** REVISION LEVEL ***	C 5-21-84	99	.00	.00	
12035	SCR PAN 6-32x3/4 BLK SS S		2	4.00	4.00	
3340001	334 QED-IIIS FRONT PANEL		1	1.00	1.00	
3340002	334 QED-IIIS SHIPPING LST		1	1.00	1.00	
3340003	334 QEDIIIS ACCESSORIES		1	1.00	1.00	
44018	CASE QED-III,301A FORMICA		12	1.00	1.00	
44125	OVERLAY QED-III SHRT INST		8	1.00	1.00	
93021	LABEL SER# 1-1/2x5/8		2	1.00	1.00	

QUESTIONNAIRE

It is important to us at Bio-Tek to hear what our customers have to say about our products and our documentation. After familiarizing yourself with the product and the manual, please take the time to answer the questions below. When you have finished our questionnaire, detach this form and mail it to us postage prepaid.

1. For which Bio-Tek product are you answering this questionnaire?

2. How extensively have you used the unit?

3. What additional features or tests would you like the unit to have?

4. Did you read this manual before operating the unit for the first time?

5. How often and under what conditions do you refer to this manual?

6. Does the manual completely describe the operational procedures?

7. Does the manual provide sufficient information to understand how the unit works?

8. What additional information should be included in the manual?

9. Should anything now in the manual be omitted?

10. Did you find any errors? If so, please specify below.

11. Were the overlays on the unit itself clear and helpful?

12. How does this manual compare with operator's manuals for othe manufacturers' equipment you have used?

13. How can we improve this manual?

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